IPv6 Router Advertisement Throttler

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The IPv6 Router Advertisement Throttler limits the amount of multicast Router Advertisements (RAs) circulating on the wireless network. The IPv6 RA throttler tracks router solicitations (RSs) and converts multicast RAs into multiple unicast RAs to forward to RS originators.

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Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table at the end of this module.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Information About the IPv6 Router Advertisement Throttler

- IPv6 RA Throttler Overview, page 1

IPv6 RA Throttler Overview

The IPv6 Router Advertisement Throttler limits the amount of multicast Router Advertisements (RAs) circulating on the wireless network. The IPv6 RA throttler tracks router solicitations (RSs) and converts multicast RAs into multiple unicast RAs to forward to RS originators.

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Scalability Feature: IPv6 RA Throttler

Data center networks with large numbers of devices face a number of scale challenges, such as effective and efficient address resolution. For example, in wireless Layer 2 domains, bandwidth may be constrained, and the amount of control traffic generated by protocols such as IPv6 Neighbor Discovery (ND) or Multicast Listener Discovery (MLD) can quickly become prohibitive.

By snooping control traffic and maintaining a binding table that stores all active devices and their addresses on the link, the amount of control traffic flooded on the Layer 2 domain can be greatly reduced. Throttling occurs when the same message is sent multiple times from several devices that do not interact with each other, but they all interact with one or more common devices (e.g., the local device). The Layer 2 device can eliminate some of these messages without any adverse consequences for the protocol itself.

IPv6 RA Throttler Parameter Inheritance

The IPv6 RA throttler allows an inheritance process by which a parameter that is not defined at a certain hierarchical level is inherited from the level above it. A parameter is defined at a given level if a policy is attached at that level and the parameter in that policy is set to a value other than `inherit`.

Level inheritance is as follows:

- PORT inherits from VLAN.
- VLAN inherits from BOX.

The levels are defined as follows:

- DEFAULT. A policy always exists implicitly at this level. The default policy fields are set as follows:

<table>
<thead>
<tr>
<th>Field</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>throttle-period</td>
<td>600 seconds, or 10 minutes.</td>
</tr>
<tr>
<td>max-through</td>
<td>10 RAs per VLAN per 10 minutes.</td>
</tr>
<tr>
<td>allow</td>
<td>at-least 1 at-most 1</td>
</tr>
<tr>
<td></td>
<td>• 1 RA per device per 10 minutes.</td>
</tr>
<tr>
<td>interval-option</td>
<td>passthrough</td>
</tr>
<tr>
<td></td>
<td>• RAs are not throttled with the interval option.</td>
</tr>
<tr>
<td>medium-type</td>
<td>wire (port only)</td>
</tr>
<tr>
<td></td>
<td>• The port is wireless.</td>
</tr>
</tbody>
</table>

- VLAN: At the VLAN level, only one policy may be attached per VLAN.
- PORT: At the PORT level, a policy can be attached to the port. Only one such policy is allowed per port per VLAN.
Policies must be attached at the VLAN or BOX level as well as at the PORT level for IPv6 RA throttler to operate at the PORT level.

IPv6 RA Throttler Command Precedence Rules

The `allow at-least` and `allow at-most` values applied at the VLAN level are the default for all devices in the VLAN. The values can be overridden on a per-port basis by applying another policy on the a specified port.

When you apply a policy on a port, any value that is not configured in that policy is inherited from the VLAN configuration. If the value is not configured in the VLAN policy, then the value is set to its default.

The `max-through` and `medium-type` commands are ignored by a VLAN or VLANs.

If your deployment has the same setting for the `allow at-least` and `allow at-most` values for all devices on all ports, then you need only to apply the policy on the relevant VLAN or VLANs. If some of wired ports in the deployment are connection wireless access points, then a policy with only the medium type configured needs to be applied on those specific ports.

Rules that are configured at the command-line interface (CLI) are applied in the following order:

1. Maximum pending hosts: If more than 35 hosts are pending, the RA throttler stops "remembering" them one by one and multicasts the next RA to all devices, including wireless devices.
2. RA interval option: If the RA has an interval option, then the `interval-option` command setting applies first. If the `interval-option throttle` command setting is configured, then this step is ignored. The default is to pass through all RAs with an interval option; that is, not to multicast the next RA to all devices, including wireless devices.
3. Per-device at-least setting: If the device that issued the RA has not yet sent the number of RAs configured by the `allow at-least` command, then the RA is multicast to all hosts, including hosts on wireless devices.
4. Per-device at-most setting: If the device that issued the RA has sent the number of RAs configured by the `allow at-most` command, then the RA is throttled. That is, the RA is multicast to all wired hosts and to wireless hosts with pending router solicitations (RSs) or reassociations.
5. Per VLAN: If the per-VLAN limit per the `max-through` command setting has been reached, then the message is throttled; otherwise, it is passed to all devices, including wireless devices.

How to Configure the IPv6 Router Advertisement Throttler

- Configuring the IPv6 RA Throttler Policy, page 3
- Attaching the IPv6 RA Throttler Policy to a VLAN or VLANs, page 5
- Attaching the IPv6 RA Throttler Policy to a Port, page 6

Configuring the IPv6 RA Throttler Policy
### SUMMARY STEPS

1. enable
2. configure terminal
3. ipv6 nd ra-throttle policy *policy-name*
4. allow \{at-least \{al-value \| no-limit \}\} | \{at-most \{am-value \| no-limit \}\} | \{inherited\}
5. interval-option \{ignore \| inherit \| pass-through \| throttle\}
6. max-through \{mt-value \| inherit \| no-limit\}
7. medium-type \{access-point \| wired\}
8. throttle-period \{seconds \| inherit\}

### DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| **Step 1** enable | Enables privileged EXEC mode.  
• Enter your password if prompted. |
| **Example:**  
Device> enable | |
| **Step 2** configure terminal | Enters global configuration mode.  
| **Example:**  
Device# configure terminal | |
| **Step 3** ipv6 nd ra-throttle policy *policy-name* | Defines the RA throttler policy name and enters IPv6 RA throttle policy configuration mode. |
| **Example:**  
Device(config)# ipv6 nd ra-throttle policy policy1 | |
| **Step 4** allow \{at-least \{al-value \| no-limit \}\} | \{at-most \{am-value \| no-limit\}\} | \{inherited\} | Limits the number of multicast RAs per device per throttle period in an RA throttler policy. |
| **Example:**  
Device(config-nd-ra-throttle)# allow at-least 2 at-most 2 | |
| **Step 5** interval-option \{ignore \| inherit \| pass-through \| throttle\} | Adjusts the IPv6 RA interval in an RA throttler policy. |
| **Example:**  
Device(config-nd-ra-throttle)# interval-option inherit | |
## Attaching the IPv6 RA Throttler Policy to a VLAN or VLANs

You must create an IPv6 RA throttler policy before attaching it to a VLAN or VLANs. See the previous step to create an IPv6 RA throttler policy.

### SUMMARY STEPS

1. enable
2. configure terminal
3. vlan configuration
4. ipv6 nd ra-throttle attach-policy

### DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 enable</td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td></td>
<td>• Enter your password if prompted.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Device&gt; enable</td>
<td></td>
</tr>
<tr>
<td>Step 2 configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Device# configure terminal</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 6 max-through</td>
<td>Limits multicast RAs per VLAN per throttle period.</td>
</tr>
<tr>
<td>{mt-value</td>
<td>inherit</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Device(config-nd-ra-throttle)# max-through 25</td>
<td></td>
</tr>
<tr>
<td>Step 7 medium-type</td>
<td>Indicates whether a device is wired or wireless.</td>
</tr>
<tr>
<td>{access-point</td>
<td>wired}</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Device(config-nd-ra-throttle)# medium-type wired</td>
<td></td>
</tr>
<tr>
<td>Step 8 throttle-period</td>
<td>Configures the throttle period in an IPv6 RA throttler policy.</td>
</tr>
<tr>
<td>{seconds</td>
<td>inherit}</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Device(config-nd-ra-throttle)# throttle-period 300</td>
<td></td>
</tr>
</tbody>
</table>

---

How to Configure the IPv6 Router Advertisement Throttler
**Command or Action** | **Purpose**
--- | ---
**Step 3** vlan configuration | Configures a VLAN or a collection of VLANs and enters VLAN configuration mode.

**Example:**
Device(config)# vlan configuration vlan1

**Step 4** ipv6 nd ra-throttle attach-policy | Attaches an IPv6 RA throttler policy to a VLAN or a collection of VLANs.

**Example:**
Device(config-vlan-config)# ipv6 nd ra-throttle attach-policy policy1

### Attaching the IPv6 RA Throttler Policy to a Port

- You must create an IPv6 RA throttler policy before attaching it to a port. See the previous step to create an IPv6 RA throttler policy.
- Policies must be attached at the VLAN or BOX level as well as at the PORT level for the IPv6 RA throttler to operate at the PORT level.

**SUMMARY STEPS**
1. **enable**
2. **configure terminal**
3. **interface** type number
4. **ipv6 nd ra-throttle attach-policy**

### DETAILED STEPS

**Command or Action** | **Purpose**
--- | ---
**Step 1** enable | Enables privileged EXEC mode.

**Example:**
Device> enable

- Enter your password if prompted.

**Step 2** configure terminal | Enters global configuration mode.

**Example:**
Device# configure terminal
### Configuration Examples for IPv6 Router Advertisement Throttler

- Example: IPv6 RA Throttler Policy Configuration, page 7
- Example: IPv6 RA Throttler VLAN Configuration, page 7

#### Example: IPv6 RA Throttler Policy Configuration

```
Device# show ipv6 nd ra-throttle policy policy2

Policy policy2 configuration:
  The throttle period will be coalesced and default to 600 seconds
  Applied to a port, this policy indicates a wired interface
  The max number of unthrottled RAs is configured on the vlan and defaults to 10
  The min and max numbers of unthrottled RAs per router will be coalesced and default to 1
  The behaviour upon RAs with an RFC 3775 interval option will be coalesced and default to passthrough

Policy applied on the following interfaces:
  Et0/0                vlan all
Policy applied on the following vlans:
  10,12-17
```

#### Example: IPv6 RA Throttler VLAN Configuration

```
Device# show ipv6 nd ra-throttle vlan vlan1

general information for vlan vlan1

RAs            last period     this period     overall
passed_through 1               1               2
throttled      4               2               6

no pending host

current Policy is tutu coalesced as:
  throttle-period 90 seconds remaining 48
  max-through 0
```
### Additional References

#### Related Documents

<table>
<thead>
<tr>
<th>Related Topic</th>
<th>Document Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPv6 addressing and connectivity</td>
<td>IPv6 Configuration Guide</td>
</tr>
<tr>
<td>Cisco IOS commands</td>
<td>Cisco IOS Master Commands List, All Releases</td>
</tr>
<tr>
<td>IPv6 commands</td>
<td>Cisco IOS IPv6 Command Reference</td>
</tr>
<tr>
<td>Cisco IOS IPv6 features</td>
<td>Cisco IOS IPv6 Feature Mapping</td>
</tr>
</tbody>
</table>

#### Standards and RFCs

<table>
<thead>
<tr>
<th>Standard/RFC</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFCs for IPv6</td>
<td>IPv6 RFCs</td>
</tr>
</tbody>
</table>

#### MIBs

No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.

To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:

http://www.cisco.com/go/mibs

#### Technical Assistance

<table>
<thead>
<tr>
<th>Description</th>
<th>Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Cisco Support and Documentation website provides online resources to</td>
<td><a href="http://www.cisco.com/cisco/web/support/index.html">http://www.cisco.com/cisco/web/support/index.html</a></td>
</tr>
<tr>
<td>download documentation, software, and tools. Use these resources to install</td>
<td></td>
</tr>
<tr>
<td>and configure the software and to troubleshoot and resolve technical issues</td>
<td></td>
</tr>
<tr>
<td>with Cisco products and technologies. Access to most tools on the Cisco</td>
<td></td>
</tr>
<tr>
<td>Support and Documentation website requires a Cisco.com user ID and password.</td>
<td></td>
</tr>
</tbody>
</table>
Feature Information for IPv6 Router Advertisement Throttler

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Table 1  Feature Information for

<table>
<thead>
<tr>
<th>Feature Name</th>
<th>Releases</th>
<th>Feature Information</th>
</tr>
</thead>
</table>
| IPv6 Router Advertisement Throttler| Cisco IOS XE Release 3.2SE | The IPv6 Router Advertisement Throttler feature limits the amount of multicast RAs circulating on the wireless network. The IPv6 RA throttler tracks RSs and converts multicast RAs into multiple unicast RAs to forward to RS originators.  
The following commands were introduced or modified: allow, interval-option, ipv6 nd ra-throttle attach-policy, ipv6 nd ra-throttle policy, max-through, medium-type, show ipv6 nd ra-throttle interface, show ipv6 nd ra-throttle policy, show ipv6 nd ra-throttle vlan, throttle-period, vlan configuration. |

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